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Oak Wilt

By Marvin E. Fowler, forest pathologist, Northeastern Forest Experiment Station

Oak wilt, caused by the fungus Ceratocystis fagacearum (Bretz) Hunt, accounts for more anxiety and is the subject of more research than any other forest tree disease in America today. So widespread is the disease that pathologists, foresters, timberland owners, and industrialists are concerned about the future of our valuable oak forests. Many property owners are fearful that the wilt may destroy their highly prized shade and ornamental oaks.

Distribution

Oak wilt has been found in 18 States, from Nebraska and Kansas in the west to Pennsylvania and North Carolina in the east (fig. 1). No one knows the origin of the Almost two decades ago disease. pathologists in Wisconsin proved that the dying of oaks-now called oak wilt—was caused by a parasitic fungus in the sap stream of the trees. At that time, the wilt was known only in Wisconsin, Minnesota, and Iowa. It had been present there at least 20 years, possibly much longer. Records of dving oaks suggest that wilt may even have been present at the turn of the century. By 1949, the disease was known also in Illinois, Indiana, and Missouri.

Surveys were started in 1950 to determine the distribution and intensity of this rapidly killing disease. Wilting trees are readily distinguished in a forest stand, even at a considerable distance. Because of this, preliminary scouting for the disease could be done from lowflying airplanes. This method proved fast and economical. Further checking on the ground and culturing specimens from suspect trees confirmed the presence of oak wilt. By 1952, the approximate current range of the disease had determined. Subsequent been scouting has not revealed its presence in any additional State.

Hosts

No native oak species is known to be immune to oak wilt. Inoculation experiments in Missouri revealed that some 50 native and exotic oaks are susceptible. The disease has also killed a number of Chinese chestnuts in a plantation in Missouri. Inoculations indicate that American chestnut, bush chinquapin, and California tanbark oak are also susceptible. Trees of any age, size, or vigor appear susceptible to this disease.

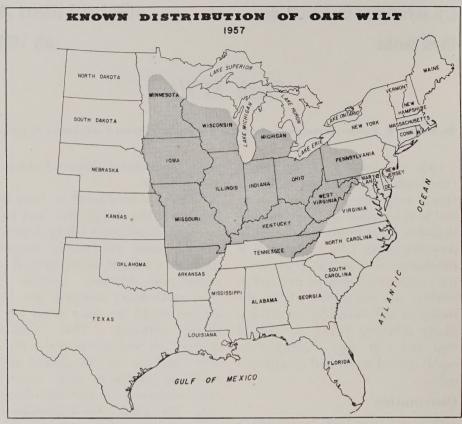


Figure 1.

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Symptoms

Symptoms of oak wilt in the red or black oak group differ considerably from those in the white oak group. In the former, early symptoms usually are limited to a wilting and bronzing of foliage in the upper crown, beginning at the ends of branches. The symptoms spread rapidly through the tree crown, downward from the top and inward along the lateral branches. The entire crown may be involved within a few weeks, and large trees may be killed within 1 or 2 months after the onset of symptoms.

The bronzing of leaves usually begins at the apex and lobes of the leaf blade, spreading to the midrib and base until the entire leaf blade is involved. As a rule, defoliation accompanies the development of foliar symptoms, and affected leaves may fall in any stage, including those fully green (fig. 2).

Premature leaf shedding during the growing season is one of the best diagnostic symptoms in red or black oaks. Sprouting frequently occurs along the trunk and larger branches before an infected tree dies. Blackened longitudinal



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Figure 2.—Tree dying of oak wilt. Severe defoliation accompanies the development of foliar symptoms.

streaks sometimes occur in the sapwood of branches, but the causal fungus can be cultured from clear wood as well as from discolored.

In the white oak group, the wilt usually develops more slowly than in the red. With most white oaks, only a single branch dies in a year, but the disease persists, killing additional branches each succeeding year until the entire tree dies, usually within 3 to 7 years. At times wilt develops and killing takes place as rapidly in bur oaks as in red oaks. In other white oaks the disease may persist even though symptoms are not evident each year, and a few of these trees apparently recover from the disease.

This failure of wilt to develop rapidly in many white oaks presents a serious problem in scouting for the disease: the symptoms are indistinct, sometimes even absent, or they may be concealed from view by surrounding healthy branches.

Spread

Oak wilt fungus may spread locally from tree to tree through natural root grafts (fig. 3), which are common among oaks growing close together. About half the infection areas observed have enlarged through local spreading. In other cases, only a single tree has been killed, and there has been no further local spread, or spread has been delayed for 2 or 3 years.

The fungus also spreads overland for distances of a mile or more, but just how this takes place is not thoroughly understood. However, the following circumstance may have some bearing on this. In some trees, following death, the fungus forms mats (fig. 4) just under the bark. Pressure pads on these

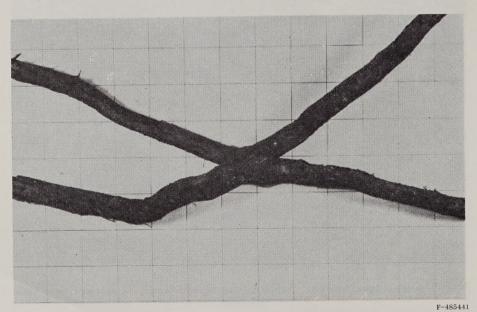
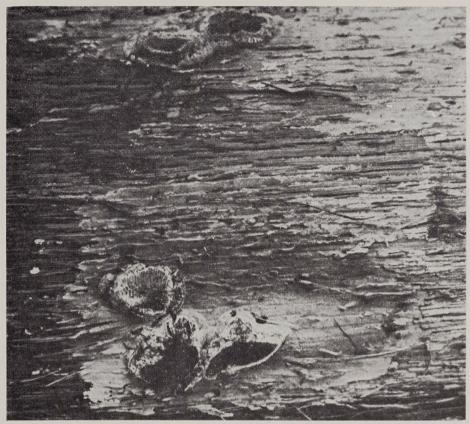


Figure 3.—A natural root graft between roots of two red oaks. Squares in the background are 2 x 2 inches.



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Figure 4.—An oak wilt mat that formed under the bark of a killed tree. The grayish portion is the fungus mat. The bulbous growths are the pressure pads that lift the bark and crack it.

mats push against the bark and may even crack or split it. These mats give off a sour odor that attracts many insects.

Sap-feeding beetles of the family Nitidulidae are common among the insects attracted to these mats, and fungus spores adhere to their bodies. These insects might transmit the fungus when they subsequently feed on the sap from a fresh wound on a healthy tree. Several other insects, taken from infected trees on which no fungus mats occurred, have also been found to be contaminated with the wilt. These

include an oak bark beetle (*Pseudopityophthorus* sp.), an ambrosia beetle, the two-lined chestnut borer (*Agrilus bilineatus* (Web.)), and a round-headed borer (*Graphisurus fasciatus* (DeG.)). It is not definitely known that any of these insects spread the disease, but the possibility does exist.

Squirrels have been seen stripping bark from over fungus mats, and birds often feed upon insects in wilt-infected trees.

The significance of these observations is not known. At present it may only be said that the wilt can spread locally through root grafts, and that overland spread may be due to insects that carry spores from either the fungus mats or the wood of infected trees.

Damage

Oak wilt has caused considerable damage in many oak woodlots and forest stands in Wisconsin, Minnesota, and Iowa. In some areas of a few to 100 acres, more than half of the oaks have been killed by wilt. An appraisal of oak wilt damage in eight Wisconsin counties revealed that about 11 percent of the annual growth increment in oak forests is offset by mortality from this disease.

Damage has been negligible in southern Missouri and eastward to the Middle Atlantic and Southeastern States. Even with thousands of infected areas, the losses account for only a tiny fraction of the tremendous volume of oak timber.

Nevertheless, the threat of oak wilt is very real. If allowed to spread unhindered, oak wilt could be disastrous, for oaks are our most valuable hardwood forest species, making up a third of all hardwood sawtimber in this country.

Control

Several States are actively engaged in control programs for the suppression of oak wilt. Though control methods vary, all are designed either to prevent local spread through root grafts, or to eliminate the hazard of overland spread from wilt-infected trees, or both.

These are the treatments now being used: (1) Diseased trees and all healthy oaks within possible root graft distance of infected trees (approximately 50 feet) are cut and their stumps poisoned; (2) the diseased trees are treated as above but the surrounding healthy trees are left standing and the areas are periodically examined to see if the disease is still active; (3) all infected trees are cut and the bark removed to prevent formation of fungus mats: (4) infected trees are cut, the stumps poisoned, and the felled trees are sprayed with a combination fungicide and insecticide: (5) a girdling cut is made deep into the heartwood of all infected trees to favor rapid drying of the tree and to prevent fungus mat formation. It is not yet known whether one or a combination of these controls is substantially more effective than others.

Conclusions

Oak wilt is a virulent disease capable of killing red oaks in a few weeks. It is already thoroughly established over a wide area. It is serious in parts of the Midwest and could become epidemic farther east or south. The slowness of its local and overland spread indicates that it can be suppressed even though complete elimination of the disease from our forests may be impossible. The vigorous control programs now in effect should prevent the wholesale destruction of our oak forests while research under way may lead to still more effective control measures.

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